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| 10/820,472 | 04/07/2004 | Stanislav I. Ionov | M-15363 US | 7559 |

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| EXAMINER | |
|---|---|
| CURS, NATHAN M | |
| ART UNIT | PAPER NUMBER |
| 2613 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/820,472 | IONOV ET AL. | |
| | Examiner | Art Unit | |
| | Nathan Curs | 2613 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *07 April 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-31* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-31* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *07 April 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *4/04*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Claim Rejections - 35 USC § 102*

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 23-25 are rejected under 35 U.S.C. 102(b) as being anticipated by Yariv (US Patent No. 6219172).

Regarding claim 23, Yariv discloses an analog-to-digital converter comprising: an optical pulse generator adapted to receive an analog electrical signal and provide optical pulses having time delays determined by the analog electrical signal; and an optical pulse discriminator adapted to receive the optical pulses and provide a digital electrical signal, wherein the digital electrical signal is based on the analog electrical signal (fig. 1 and col. 4, line 18 to col. 5, line 2).

Regarding claim 24, Yariv discloses the analog-to-digital converter of claim 23, wherein values of the digital electrical signal are digital representations of corresponding values of the analog electrical signal (col. 4, lines 18-21).

Regarding claim 25, Yariv discloses the analog-to-digital converter of claim 23, wherein the optical pulse generator comprises a waveguide adapted to receive the optical pulses and provide the time delays to the optical pulses under control of the analog electrical signal (col. 4, lines 31-44).

***Double Patenting***

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

4. Claims 1-31 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1, 3, 5, 6, 8, 25-7 and 29-32 of copending Application No. 10/820915 in view of Ionov (US Patent Application Publication No. 2003/0048971).

This is a provisional obviousness-type double patenting rejection.

Regarding claim 1, 10/820915 claims a PPM-to-digital converter comprising: means for receiving an optical signal with time delay and providing an output optical signal having a wavelength based on the time delay; a demultiplexer adapted to route the output optical signal to one of a plurality of optical paths based on the wavelength; photodetectors adapted to convert optical signals in the optical paths into electrical signals; and a discriminating circuit adapted to receive the electrical signals and determine which of the optical paths provided the output optical signal to provide a digital electrical output signal (claim 1 and claims 25-27). 10/820915 does not claim that a waveguide adapted to receive an optical-signal and an analog

electrical signal, wherein the waveguide is adapted to provide a desired time delay to the optical signal based on a value of the analog electrical signal. However, Ionov discloses creating a PPM signal using a waveguide adapted to receive an optical-signal and an analog electrical signal, wherein the waveguide is adapted to provide a desired time delay to the optical signal based on a value of the analog electrical signal (fig. 2 and paragraph 0002-0005 and 0011-0019). It would have been obvious to one of ordinary skill in the art at the time of the invention to use a PPM signal created from analog electrical signal using the means described by Ionov, to provide the benefit of transmitting radio frequency or analog optical signals using the PPM signal, as described by Ionov.

Regarding claim 2, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 1, further comprising a fiber optic circulator adapted to provide the optical signal to the waveguide and the optical signal with the time delay to the receiving means (Ionov: fig. 2).

Regarding claim 3, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 1, wherein the receiving means comprises: a fiber assembly adapted to provide self-phase modulation and dispersion to the optical signal or to an optical clock signal; and an optical switch adapted to receive the optical signal and the optical clock signal and provide the output optical signal (10/820915: claim 1).

Regarding claim 4, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 3, further comprising filters adapted to filter the optical signals in the optical paths (10/820915: claim 3).

Regarding claim 5, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 1, wherein the receiving means comprises: dispersive elements adapted to impart a chirp onto the optical signal and an optical clock signal; and an optical

nonlinearity device adapted to receive the optical signal and the optical clock signal and to provide the output optical signal (10/820915: claim 25).

Regarding claim 6, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 5, wherein the frequency of the optical signal and the optical clock signal are slewed at the same rate but in opposite directions, at the same rate and direction, or at a different rate but in the same direction (10/820915: claim 29).

Regarding claim 7, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 1, wherein the waveguide comprises a chirped distributed Bragg reflector (Ionov: paragraph 0014).

Regarding claim 8, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 1, wherein the waveguide comprises at least one layer of an electro-optically active material having a refractive index controlled by the analog electrical signal (Ionov: paragraphs 0011-0019).

Regarding claim 9, 10/820915 claims a method of providing PPM-to-digital conversion, the method comprising: providing an optical signal pulse having a time delay controlled by an analog electrical signal; converting the optical signal pulse with the time delay to an optical output signal pulse having a wavelength based on the time delay; and providing a digital electrical output signal, corresponding to the wavelength of the optical output signal pulse (claims 1, 25-27 and 30-32). 10/820915 claims providing an optical signal pulse having a time delay, but does not claim that the time delay is controlled by an analog electrical signal and that a value of the digital electrical output signal is based on a value of the analog electrical signal. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Ionov with 10/820915 as described above for claim 1.

Regarding claim 10, the combination of 10/820915 and Ionov discloses the method of claim 9, further comprising: routing the optical output signal pulse to one of a plurality of paths based on the wavelength; converting the optical output signal pulse to an electrical signal; and determining the value of the digital electrical output signal based on which path provided the optical output signal pulse (10/820915: claims 1 and 32).

Regarding claim 11, the combination of 10/820915 and Ionov discloses the method of claim 10, further comprising filtering the optical output signal pulse (10/820915: claim 3).

Regarding claim 12, the combination of 10/820915 and Ionov discloses the method of claim 10, wherein the converting comprises providing self-phase modulation and dispersion to the optical signal pulse with the time delay (10/820915: claim 1).

Regarding claim 13, 10/820915 claims a PPM-to-digital converter system comprising: a fiber assembly adapted to receive the optical pulses or clock pulses and provide self-phase modulation and dispersion; an optical switch, coupled to the fiber assembly, adapted to receive the optical pulses and the clock pulses and provide output optical pulses having wavelengths corresponding to the time delays; and a discriminator adapted to receive the output optical pulses and provide digital electrical output signals based on the wavelengths (claims 1 and 25-27). 10/820915 claims the PPM signal but does not claim an analog delay modulator adapted to receive an analog electrical signal and to provide optical pulses having time delays determined by the analog electrical signal. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Ionov with 10/820915 as described above for claim 1.

Regarding claim 14, the combination of 10/820915 and Ionov discloses the system of claim 13, wherein values of the digital electrical output signals are based on values of the analog electrical signal (10/820915: claims 1 and 25-27 as applicable in the combination).

Regarding claim 15, the combination of 10/820915 and Ionov discloses the system of claim 13, wherein the analog delay modulator comprises: an optical pulse generator adapted to provide the optical pulses; and a waveguide adapted to receive the optical pulses and the analog electrical signal and apply the time delays to the optical pulses under the control of the analog electrical signal (Ionov: fig. 2 and paragraphs 0011-0019).

Regarding claim 16, the combination of 10/820915 and Ionov discloses the system of claim 15, wherein the analog delay modulator further comprises a fiber optic circulator adapted to route the optical pulses to and from the waveguide (Ionov: fig. 2).

Regarding claim 17, the combination of 10/820915 and Ionov discloses the system of claim 16, wherein the waveguide comprises a chirped distributed Bragg reflector (Ionov: paragraph 0014).

Regarding claim 18, the combination of 10/820915 and Ionov discloses the system of claim 13, wherein the discriminator comprises: a demultiplexer adapted to route the output optical pulses to one of a plurality of paths based on the wavelength; photodetectors adapted to convert the output optical pulses to electrical signals; and a discriminating circuit adapted to receive the electrical signals and provide the digital electrical output signals based on which path carried the corresponding output optical pulses (10/820915: claim 1).

Regarding claim 19, the combination of 10/820915 and Ionov discloses the system of claim 18, further comprising filters, coupled to the photodetectors, and adapted to filter the output optical pulses (10/820915: claim 3).

Regarding claim 20, the combination of 10/820915 and Ionov discloses the system of claim 13, wherein the demultiplexer comprises an arrayed-waveguide grating demultiplexer or a wavelength-independent star coupler (10/820915: claim 6).

Regarding claim 21, the combination of 10/820915 and Ionov discloses the system of claim 13, wherein the discriminating circuit provides frequency shift keying detection (10/820915: claim 8).

Regarding claim 22, the combination of 10/820915 and Ionov discloses the system of claim 13, wherein the optical pulses are pulse position modulated optical signals (10/820914: claim 1).

Regarding claim 23, 10/820915 claims a PPM-to-digital converter comprising: an optical pulse discriminator adapted to receive the optical pulses and provide a digital electrical signal (claims 1 and 25-27). 10/820915 does not claim an optical pulse generator adapted to receive an analog electrical signal and provide optical pulses having time delays determined by the analog electrical signal or that the digital electrical signal is based on the analog electrical signal. However, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Ionov with 10/820915 as described above for claim 1.

Regarding claim 24, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 23, wherein values of the digital electrical signal are digital representations of corresponding values of the analog electrical signal (10/820915: claims 1 and 25-27 as applicable in the combination).

Regarding claim 25, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 23, wherein the optical pulse generator comprises a waveguide adapted to receive the optical pulses and provide the time delays to the optical pulses under control of the analog electrical signal (Ionov: fig. 2 and paragraphs 0011-0019).

Regarding claim 26, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 25, wherein the waveguide comprises at least one layer of electro-optically active material having refractive index variations which form a chirped distributed Bragg

reflector, wherein the analog electrical signal controls an index of refraction of the electro-optically active material (Ionov: fig. 2 and paragraphs 0011-0019).

Regarding claim 27, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 25 wherein the optical pulse generator further comprises a fiber optic circulator adapted to direct the optical pulses to and from the waveguide (Ionov: fig. 2 and paragraphs 0011-0019).

Regarding claim 28, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 23, wherein the optical pulse discriminator comprises: a fiber assembly adapted to spectrally broaden and chirp the optical pulses or optical clock pulses; an optical switch adapted to receive the optical pulses and the optical clock pulses, after the optical pulses or the optical clock pulses are spectrally broadened and chirped by the fiber assembly, and provide an optical output pulse corresponding to each of the optical pulses and having a wavelength based on the time delay of the optical pulse; a demultiplexer adapted to direct each of the optical output pulses to one of a plurality of optical paths based on its wavelength; photodetectors adapted to convert the optical output pulses to electrical output signals; and a discriminating circuit adapted to receive each of the electrical output signals and provide the corresponding digital electrical signal (10/820915: claim 1).

Regarding claim 29, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 28, wherein the corresponding digital electrical signal for each of the electrical output signals is based on which of the optical paths carried the corresponding optical output pulse, wherein a value of the digital electrical signal is a digital representation of a corresponding value of the analog electrical signal (10/820915: claim 1 as applicable in the combination).

Regarding claim 30, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 23, wherein the optical pulse discriminator comprises: dispersive elements adapted to impart a chirp onto the optical pulses and optical clock pulses; an optical nonlinearity device adapted to receive the optical pulses and the optical clock pulses and provide an optical output pulse corresponding to each of the optical pulses and having a wavelength based on the time delay of the optical pulse; a demultiplexer adapted to direct each of the optical output pulses to one of a plurality of optical paths based on its wavelength; photodetectors adapted to convert the optical output pulses to electrical output signals; and a discriminating circuit adapted to receive each of the electrical output signals and provide the corresponding digital electrical signal (10/820915: claims 1 and 5).

Regarding claim 31, the combination of 10/820915 and Ionov discloses the analog-to-digital converter of claim 30, wherein the corresponding digital electrical signal for each of the electrical output signals is based on which of the optical paths carried the corresponding optical output pulse, wherein a value of the digital electrical signal is a digital representation of a corresponding value of the analog electrical signal (10/820915: claim 1 as applicable in the combination).

## *Conclusion*

5. Any inquiry concerning this communication from the examiner should be directed to N. Curs whose telephone number is (571) 272-3028. The examiner can normally be reached on M-F (from 9 AM to 5 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan, can be reached at (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Any inquiry of

a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (800) 786-9199.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pairdirect.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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